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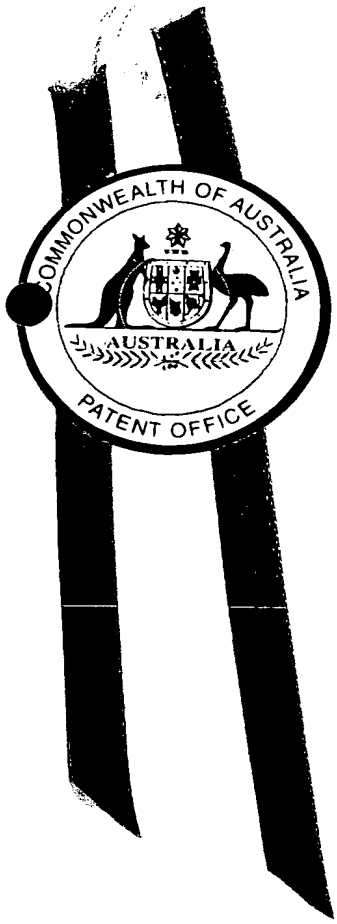
I, LEANNE MYNOTT, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PQ 2387 for a patent by ALIGNED INITIAL CONCEPTS PTY LTD filed on 23 August 1999.



WITNESS my hand this
Thirtieth day of June 2000

L. Mynott

LEANNE MYNOTT
TEAM LEADER EXAMINATION
SUPPORT AND SALES

AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION

Applicant(s):

ALIGNED INITIAL CONCEPTS PTY LTD

ACN 088 075 852

Invention Title:

A NON-RETURN VALVE

The invention is described in the following statement:

A NON-RETURN VALVE

This invention relates generally to a non-return valve and a membrane being permeable in one direction only. It is the applicant's intention to combine the disclosure of the present specification with that of the applicant's Australian petty patent application No. 35045/99 which was filed on 15 June 1999 and is included herein by way of reference.

According to one aspect of the present invention there is provided a non-return valve comprising:

a valve body including a fluid passageway which defines a fluid inlet and a fluid outlet, the fluid passageway being adapted to allow a flow of fluid from the inlet to the outlet; and

at least two valve diaphragms being axially spaced along and connected across the fluid passageway, each of the diaphragms including a collapsible aperture and being constructed of a resiliently flexible material which is configured wherein each of the diaphragms themselves effects closure of the collapsible aperture to prevent fluid flowing in a reverse direction toward the inlet whereas pressure imposed on an inlet side of either of the axially spaced diaphragms deflects said diaphragm to expose the corresponding aperture and allow fluid to flow through the passageway and across said diaphragm toward the fluid outlet only.

According to another aspect of the present invention there is provided a fail-safe non-return valve including a bank or series of non-return valves of similar construction coupled to one another, each of said non-return valves comprising:

a valve body including a fluid passageway which defines a fluid inlet and a fluid outlet, the fluid

passageway being adapted to allow a flow of fluid from the inlet to the outlet; and

a valve diaphragm being connected across the fluid passageway and including a collapsible aperture, the valve diaphragm being constructed of a resiliently flexible material and being configured wherein the diaphragm itself in a collapsed condition effects closure of the collapsible aperture to prevent fluid flowing in a reverse direction toward the inlet whereas pressure imposed on an inlet side of the diaphragm deflects the diaphragm to expose the aperture and allow fluid to flow through the passageway from the inlet to the outlet only.

Generally the non-return valves are coupled together with their respective valve bodies at least partly nested within one another wherein said valves are co-axially aligned. Alternatively the non-return valves are each of the same construction and configured to abut or engage one another with their valve bodies in alignment.

Preferably each of the diaphragms is formed integral with the corresponding valve body. More preferably the diaphragms are each in the form of a generally conical-shaped diaphragm having the collapsible aperture located at or adjacent its apex which is orientated in a downstream flow direction.

Typically each of the diaphragms is constructed of a mouldable polymeric material. More typically the polymeric material is an elastomer such as a rubber material. Alternatively the polymeric material is a nylon-based material.

According to a further aspect of the present invention there is provided a non-return valve comprising:

a valve body including a passageway which defines an inlet and an outlet, the passageway being adapted to receive means for actuating the valve;

at least two valve diaphragms being axially spaced along and connected across the passageway, each of the diaphragms including a collapsible aperture and being constructed of a resiliently flexible material which is configured wherein each of the diaphragms themselves effects closure of the collapsible aperture to prevent fluid flowing in a reverse direction toward the inlet whereas engagement of said actuating means with at least one of the diaphragms exposes its corresponding aperture and allows passage across said diaphragm toward the fluid outlet only.

Generally said actuating means is a fluid nozzle which is retractably inserted into at least one of the collapsible apertures to permit a flow of fluid across the corresponding diaphragm via the fluid nozzle.

According to yet another aspect of the present invention there is provided a membrane being permeable in one direction only, said membrane comprising a panel or blanket of collapsible diaphragms each including a collapsible aperture and being constructed of a resiliently flexible material which is configured wherein each of the diaphragms themselves effects closure of the collapsible aperture to prevent fluid flowing in a reverse direction whereas pressure imposed on an upstream side of the membrane deflects one or more of the diaphragms to expose the corresponding aperture and allow fluid to flow across the membrane in said one direction only.

Generally the membrane is multi-layered with a series of said panels or blankets formed adjacent one another.

In order to achieve a better understanding of the nature of the present invention several preferred embodiments of a non-return valve and a membrane being permeable in one direction only will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 illustrates three embodiments of a non-return valve according to this invention;

Figures 2A to 2C depict another embodiment of a non-return valve incorporated in a quick connect coupling of a hydraulic line;

Figure 3 is an exploded sectional view of various components of the non-return valve of Figures 2A to 2C; and

Figure 4 is a sectional representation of a membrane according to another aspect of the invention being permeable in one direction only.

As shown in Figure 1 there are three embodiments of a non-return valve 10 comprising a bank or series of non-return valves such as 12 and 14 of similar construction coupled to one another. The overall non-return valve 10 is thus of a "fail-safe" configuration. For ease of reference and in order to avoid repetition like components have been designated with the same reference numerals.

In this particular construction of the fail-safe non-return valve 10 each of the series of non-return valves such as 12 and 14 includes a valve body such as 16 or 18 together with a corresponding valve membrane such as 20 or 22. The valve bodies 16 or 18 are generally tubular and moulded together with the corresponding diaphragm 20 or 22 which is configured as a generally conical-shaped element. Importantly, the diaphragm 20 or 22 includes a collapsible aperture 24 or 26 formed at its apex. The conical diaphragm 20 or 22 is orientated with its apex in a downstream flow direction.

In this example the collapsible diaphragms 20 and 22 are moulded from a polymeric material, preferably an elastomer such as rubber or a nylon-based material. The particular shape of the diaphragm 20 or 22 together with the resilient material from which it is constructed ensures that the diaphragm 20 or 22 in a collapsed condition obstructs or closes the aperture 24 or 26 to prevent fluid flowing in an upstream direction. On the other hand, with pressure imposed on an upstream side of either of the diaphragms 20 or 22 said diaphragm is deflected to expose the corresponding collapsible aperture 24 or 26. Thus, with the collapsible apertures 24 or 26 exposed fluid is allowed to flow in a downstream direction through the fail-safe non-return valve 10.

Figure 1 depicts two configurations of the fail-safe non-return valve 10 where either two non-return valves such as 12 and 14 are nested within one another or are of substantially the same configurations and merely abut one another. In the "nested" embodiment of the fail-safe non-return valve 10 the outer body 16 of the outer valve 12 is internally threaded and designed to engage the inner body 18 of the inner valve 14. In the other embodiment, adjacent valve bodies 16 and 18 are aligned with one another and may together be housed or contained within a valve casing (not shown). In both cases the valve diaphragms such as 20 and 22 are oriented such that their respective collapsible apertures 24 and 26 are aligned and coaxial with one another. An internal bore of the valve bodies 16 and 18 together defines a fluid passageway 28 of the non-return valve 10 including a fluid inlet 30 and outlet 32.

Figures 2A to 2C illustrate another aspect of a non-return valve according to the invention which in this embodiment is designed to be incorporated in a quick connect coupling

shown generally as 50 of a hydraulic line or hose 52. The hydraulic coupling 50 is designed to threadably engage a valve casing 54 in which another embodiment of a non-return valve 100 is mounted. For ease of reference and in order to avoid repetition components of this non-return valve 100 which are similar to the non-return valve 10 described above are designated with an additional "0". For example, the diaphragms are designated as 200 and 220.

In this application the valve diaphragms 200 and 220 are actuated not by fluid pressure but rather via a fluid nozzle which in this example is in the form of a fluid injector 56 which is connected to the hydraulic hose 52 via barbs 58 formed about a periphery of the injector 56. Figures 2A to 2C show the sequential steps involved in connecting the quick coupling 50 to the casing 54. The injector coupling 50 is initially slid longitudinally along the injector 56 until it abuts an annular flange 60 formed about the injector 56. The injector 56 is then pressed into engagement with the diaphragms 200 and 220 so as to expose their corresponding collapsible apertures 240 and 260. The coupling 50 is progressively threaded onto the casing 54 so as to drive the injector 56 into engagement with the diaphragms 200 and 220. Thus, in this example, hydraulic fluid or the like which is contained in the casing 54 and any associated plumbing is allowed to flow to the flexible hose 52 upon connection of the quick coupling 50. The nozzle 56 thus serves as the means for actuating the valve 100 of this particular aspect of the invention.

Figure 3 illustrates an exploded sectional view of the valve 100 incorporated in the quick connect hydraulic coupling described. Each of the valve bodies 120 and 140 is designed to coaxially press-fit within the casing 54. Each body 120 and 140 includes an annular recess 62 being shaped complementary to and designed to be engaged by a

corresponding ridge 64 formed circumferentially within an inner surface of the casing 54.

Figure 4 depicts one example of a membrane 1000 of another aspect of the invention. The membrane 1000 is permeable in one direction only and on a microscopic scale may be applied as a means of repairing a lung. The membrane 1000 is multi-layered with a series of panels or blankets of collapsible diaphragms such as 2000 being formed alongside one another. In this embodiment each of the diaphragms such as 2000 includes a corresponding valve body 1600 which is formed integral with an adjacent valve body of an adjacent diaphragm. However, it should be appreciated that the membrane 1000 need not include this arrangement of valve bodies but rather may be limited to a panel or blanket of interconnected collapsible diaphragms. In any case the membrane 1000 functions along the same lines as the non-return valve 10 described above. That is, pressure imposed on an upstream side of the membrane 1000 deflects one or more of the diaphragms such as 2000 to expose its corresponding aperture 2400 to allow fluid to flow across the membrane 1000. On the other hand, without a positive pressure imposed on the upstream side of the membrane 1000, the diaphragms such as 2000 are in a collapsed condition such that the collapsible apertures such as 2400 are closed to prevent the flow of fluid in a reverse direction across the membrane 1000.

It will be apparent to persons skilled in the art that the invention described herein is susceptible to variations and modifications other than those specifically described. For example, the diaphragm may be constructed of practically any resiliently flexible material which in a collapsed condition obstructs the collapsible aperture to prevent flow across the valve or membrane. The non-return valves may extend to applications other than those described

above. For example, the fail-safe non-return valve may be connected across the skin of a ships hull and provide a means of quick evacuation where the human body can slip through the dual or multiple diaphragm valves.

All such variations and modifications are to be considered within the ambit of the present invention the nature of which is to be determined from the foregoing description.

Dated this 23rd day of August 1999

ALIGNED INITIAL CONCEPTS PTY LTD

By their Patent Attorneys

GRIFFITH HACK

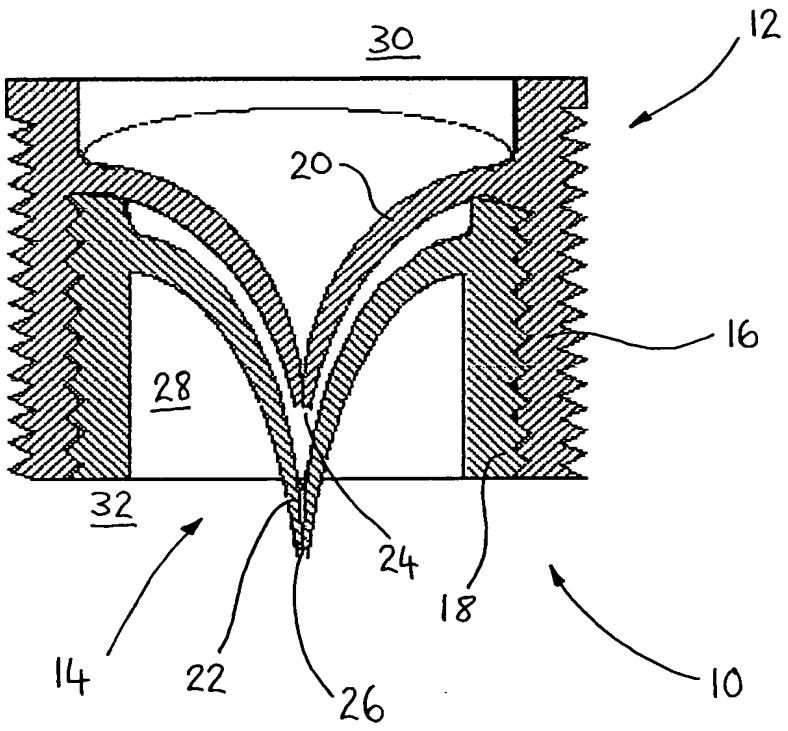


FIG. 1

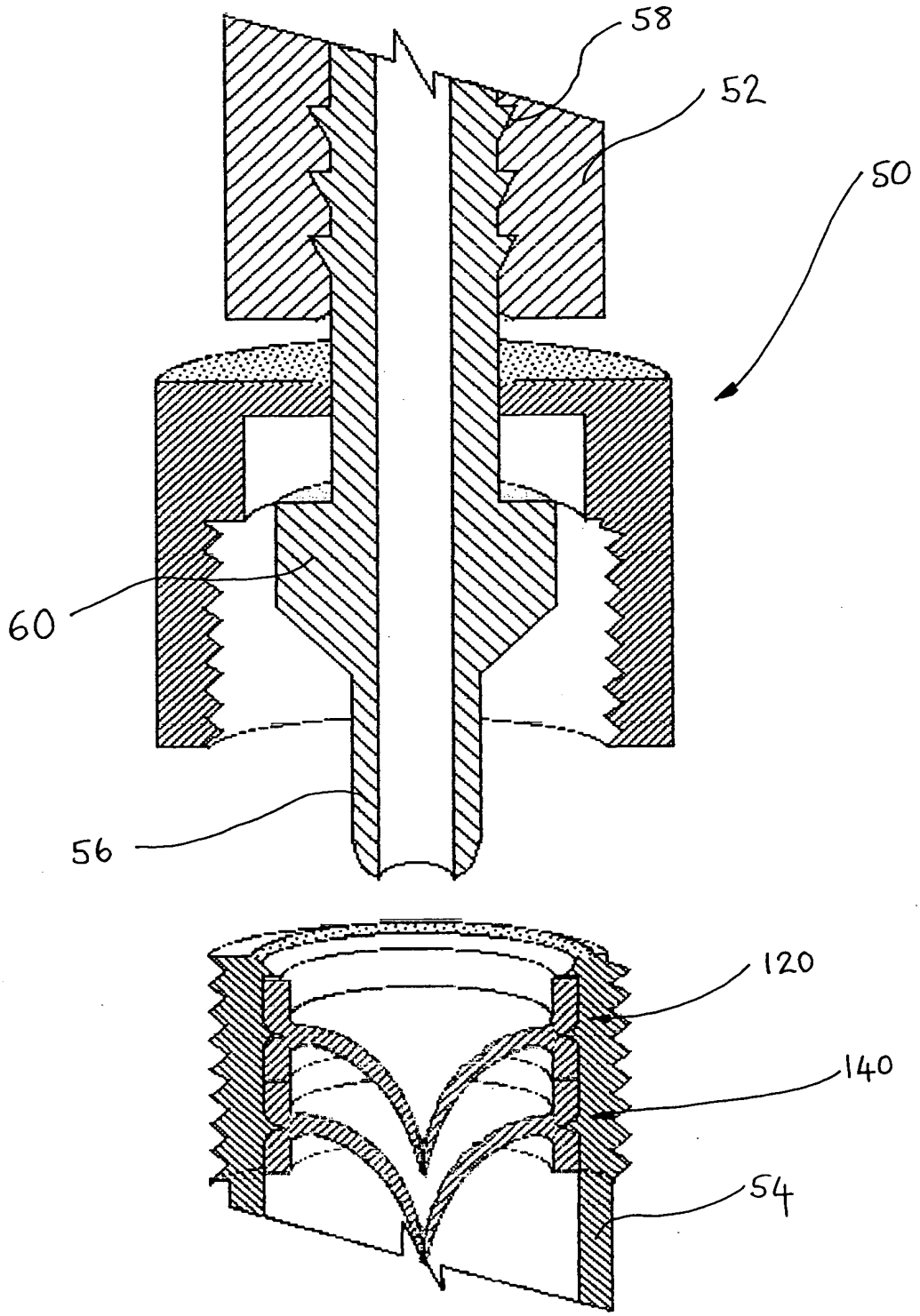


FIG. 2A

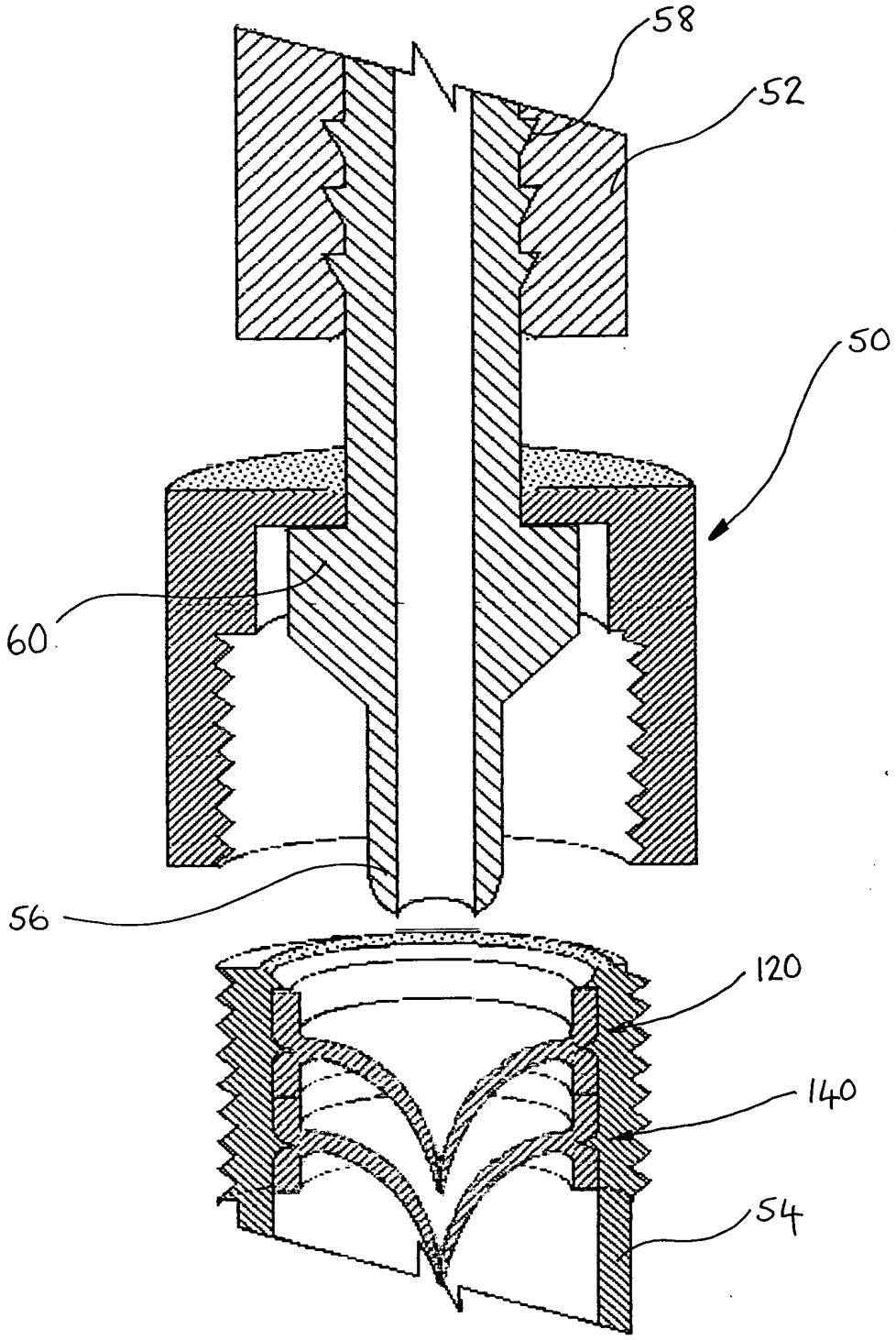


FIG. 2B

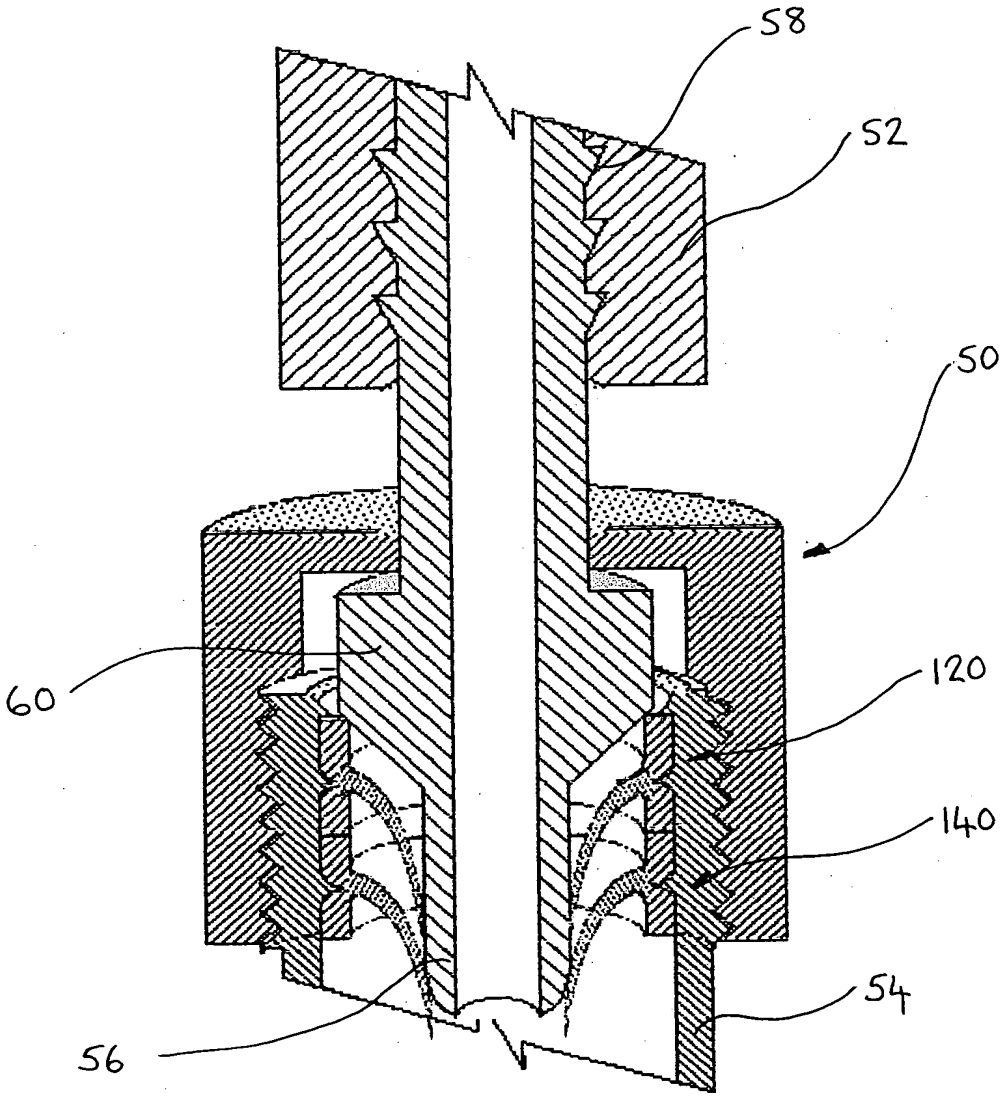


FIG. 2C

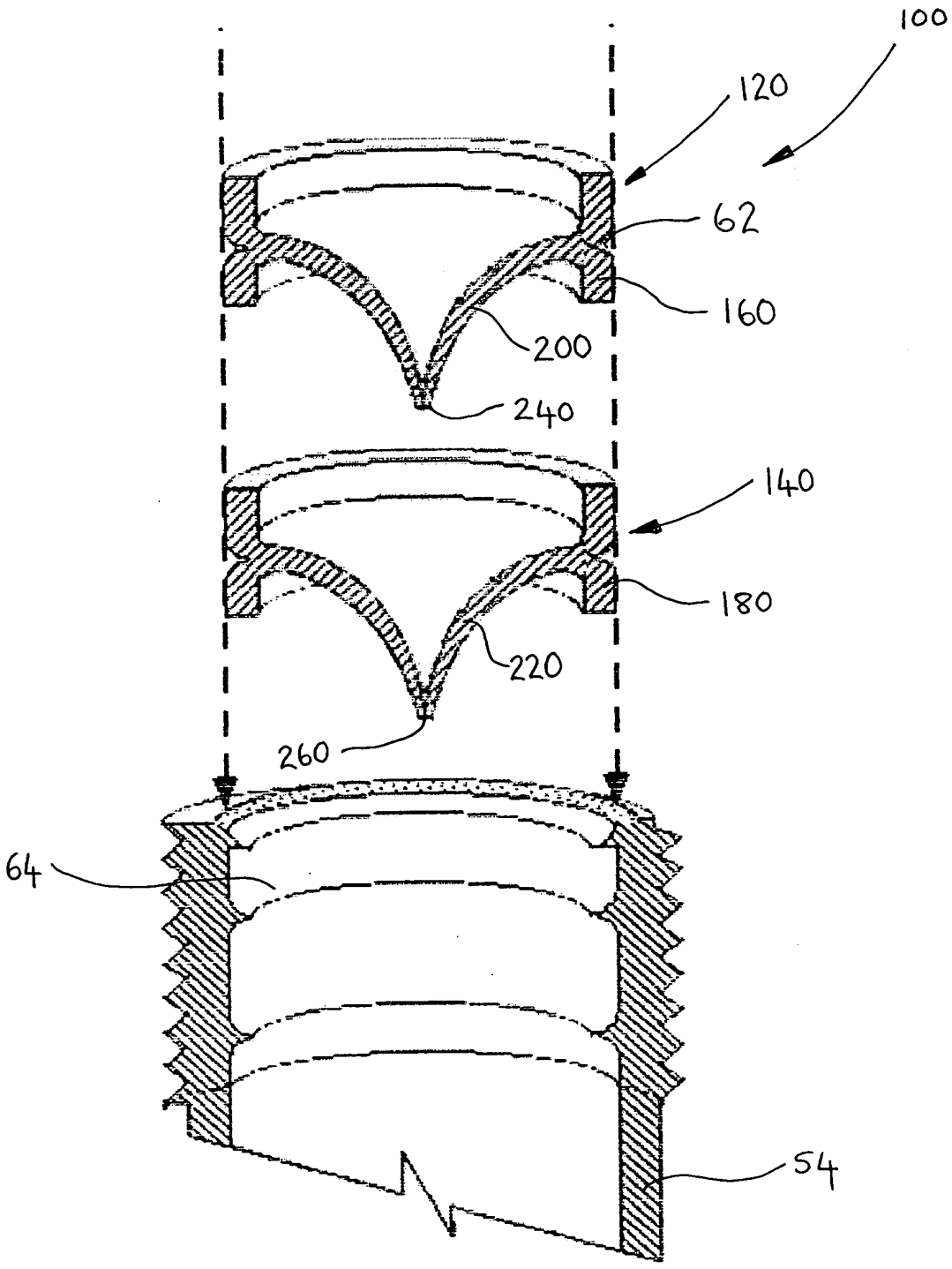


FIG. 3

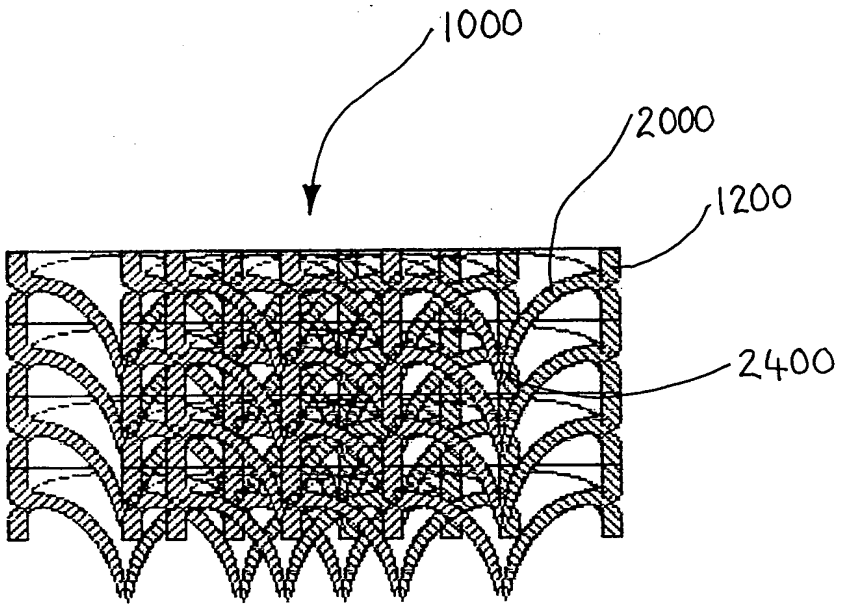


FIG. 4

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I, ANNA MAIJA EVERETT, ACTING TEAM LEADER EXAMINATION SUPPORT & SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PQ 4713 for a patent by ALIGNED INITIAL CONCEPTS PTY LTD filed on 15 June 1999.

I further certify that pursuant to the provisions of Section 37 of the Patents Act 1990 Application No. 35045/99 was treated as a provisional application and reallocated no. PQ 4713.

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WITNESS my hand this
Twenty-eighth day of June 2000

A. M. Everett.

ANNA MAIJA EVERETT
ACTING TEAM LEADER
EXAMINATION SUPPORT & SALES

AUSTRALIA

PATENTS ACT 1990

ORIGINAL

COMPLETE SPECIFICATION

PETTY PATENT

Invention Title:

A NON-RETURN VALVE

Name of Applicant:

ALIGNED INITIAL CONCEPTS PTY LTD
ACN 088 075 852

The following statement is a full description of this invention, including the best method of performing it known to me/us:

Sec. 37
...PLICATION IS TO BE
...AND TO HAVE ALWAYS BEEN,
A PROVISIONAL APPLICATION.

21/12/99
DELEGATE OF THE COMMISSIONER DATE

A NON-RETURN VALVE

The present invention relates generally to a non-return valve such as that used on a pneumatic tyre.

Although non-return valves are common in industrial and domestic applications, they are probably most prolific on pneumatic tyres. Figure 1 illustrates the various components of a conventional pneumatic non-return valve 1. The valve 1 comprises an inlet casing 2 which is screw threaded within a valve stem of a tyre (not shown). The inlet casing 2 houses a shaft 3 along which a valve member 4 slidably moves. The valve member 4 is biased against a seat 5 of the casing 2 under the force of a compression spring 6 so as to close the valve 1. A spring retainer 7 is connected to an end of the shaft 3 so as to retain the compression spring 6. Pressurisation of the non-return valve 1 releases the valve member 4 from the seat 5 to allow filling of the tyre.

The conventional pneumatic non-return valve 1 acknowledged above suffers from at least the following problems:

i) the valve 1 has a relatively large number of components which may require periodic servicing and maintenance;

ii) the valve 1 is expensive including relatively complex machined components; and

iii) the valve is complicated in operation and thus in operation may be susceptible to failure.

According to one aspect of the present invention there is provided a non-return valve comprising:

a valve body including a fluid passageway which defines a fluid inlet and a fluid outlet, the fluid

passageway being adapted to allow a flow of fluid from the inlet to the outlet; and

a valve membrane connected across the fluid passageway, the valve membrane including a collapsible opening and being constructed of a resiliently flexible material whereby the valve membrane in a collapsed condition obstructs or closes the collapsible opening to prevent fluid flowing in a reverse direction toward the inlet whereas pressure imposed on an inlet side of membrane deflects the membrane to expose the opening and allow fluid to flow through the passageway from the inlet to the outlet only.

According to another aspect of the present invention there is provided a non-return valve comprising:

a valve body including a passageway which defines an inlet and an outlet, the passageway at least partly being adapted to retractably receive a fluid nozzle; and

a valve membrane connected across the passageway, the valve membrane including a collapsible opening through which the fluid nozzle is retractably received and being constructed of a resiliently flexible material whereby the valve membrane in a collapsed condition obstructs or closes the collapsible opening to prevent fluid flowing in a reverse direction toward the inlet whereas insertion of the nozzle through the opening deflects the membrane to permit a flow of fluid through the passageway and across the membrane from the inlet to the outlet only via the fluid nozzle.

Generally the fluid is a liquid such as petrol and the non-return valve serves to prevent a reverse flow or escape of vapours.

Preferably the valve body is designed to fit to a reservoir or tank in which fluid is to be dispersed via the fluid nozzle. For example, the non-return valve is configured to fit to a petrol tank.

Preferably the valve membrane is formed integral with the valve body. More preferably the valve membrane is in the form of a generally conical-shaped diaphragm having the collapsible opening located at or adjacent its apex which is orientated in a downstream flow direction.

Typically the valve membrane is constructed of a mouldable polymeric material. More typically the polymeric material is an elastomer such as a rubber material. Alternatively the polymeric material is a nylon-based material.

Preferably the valve body is configured to retrofit to an existing valve stem. Alternatively the valve body is designed to be sealably inserted into a flow line.

Generally the fluid is water or compressed air.

In order to facilitate a better understanding of the nature of the present invention several embodiments of a non-return valve will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a general assembly of a conventional pneumatic non-return valve;

Figure 2 illustrates three stages in the general assembly of a non-return valve according to one embodiment of the invention;

Figure 3 is a general assembly of another embodiment of the invention suitable for use with irrigation tubing;

Figure 4 is a general assembly of a further embodiment of a non-return valve of the invention suitable for use in pneumatic tyres;

Figure 5 is an assembly of a non-return valve of yet another embodiment of the invention suitable for tubeless pneumatic tyres;

Figure 6 is a general assembly of a non-return valve of another aspect of the invention;

Figure 7 is an elevational and part cutaway view of a tool suitable for moulding of the non-return valve;

Figure 8 is a part cutaway together with an enlarged view of the tool of Figure 7; and

Figure 9 is sectional views of the tool of Figures 7 and 8.

As shown in Figures 2 to 5 there are various embodiments of a non-return valve shown generally as 10 constructed in accordance with one aspect of the invention. For ease of reference and in order to avoid repetition like components have been designated with the same reference numerals.

In each example the non-return valve 10 comprises a valve body 12 and a valve membrane 14. The valve body 12 is generally tubular and includes an elongate passageway 16 having an inlet and an outlet defined at its opposing ends 18 and 20, respectively.

The non-return valve 10 of these embodiments is moulded from a polymeric material, preferably an elastomer such as rubber or a nylon-based material. The selection of the appropriate material for the valve 10 will be obvious to one skilled in the art without trial and experimentation. The valve membrane 14 is in the form of a conical-shaped diaphragm formed integral with the tubular valve body 12. The diaphragm 14 is configured as a generally conical-

shaped element having a collapsible opening or aperture 22 located at or adjacent its apex. The conical diaphragm 14 is orientated with its apex in a downstream flow direction. The resiliently flexible material from which the diaphragm 14 is constructed ensures that the diaphragm 14 in a collapsed condition obstructs or closes the aperture 22 to prevent fluid flowing in a reverse direction toward the inlet 18. On the other hand, pressurisation of fluid within the passageway 16 on the inlet side of the diaphragm 14 deflects the diaphragm 14 to expose the aperture 22. Thus, with the aperture 22 exposed fluid is allowed to flow through the passageway 16 from the inlet 18 to the outlet 20 only.

Figures 2 to 5 depict installation of variations on the non-return valve 10 in various applications. The non-return valve 10 of Figure 2 is flared at its inlet 18 and is configured to seat within an internally and externally threaded nipple 24. An externally threaded conduit 26 and an internally threaded conduit 28 then threadably engage the respective male/female threaded nipple 24 so as to form a mated union shown generally as 30. The mated union 30 is designed so that sufficient compression is applied to the valve body 12 to seal it within the nipple 24. It will be appreciated that the non-return valve 10 can be adapted to suit any standard and pre-existing plumbing components such as the threaded nipple 24 and conduits 26 and 28 described.

Figure 3 shows another non-return valve 10 which in this embodiment is suitable as a "slip on union" such as that used with adjacent lengths of irrigation tubing such as 32 and 34. In this example the tubing 32 and 34 is expanded over respective ends of the tubular valve body 12. As indicated in enlarged detail one or more barbs such as 36 may be included in the valve body 12 to both provide firm

engagement with and enhance the seal between the tube 32 and 34 and the valve body 12. Fitting of the polyethylene tube 32 or 34 to the valve 10 may involve heating of the tubing to improve its pliability. The tubing 32 or 34 will naturally cool under ambient conditions after it has been slipped over the valve body 12.

Figure 4 shows another variant of the non-return valve 10 which may be substituted for the conventional pneumatic non-return valve 1. In this embodiment the valve body 12 is provided with an external thread 38 for securing the valve 10 within a stem 40. The stem 40 is preferably that of the conventional pneumatic non-return valve 1.

Figure 5 shows installation of the non-return valve 10 of Figure 4 in a pneumatic tyre of a tubeless configuration. The valve stem 40 is located in a conventionally fabricated rubber casing 42 which includes an annular channel 44 in which a wheel rim is seated. Alternatively, the rubber casing may be formed integral with the non-return valve 10. In this example the height of the rubber casing 42 or valve body 12 is reduced so that it is stiffened for insertion into the wheel rim. Furthermore, an inner lip 46 of the casing or valve body 12 is reduced in sectional size and profile so as to assist in seating of the channel 44 about the rim.

Figure 6 illustrates one example of a non-return valve 50 according to another aspect of the invention. The non-return valve 50 is similar in construction to those described above with a tubular valve body 52 and a conical-shaped diaphragm 54. The tubular body 52 includes a passageway 56 defining an inlet and outlet 58 and 60 either side of the diaphragm 54. The diaphragm 54 is formed

integral with the valve body 52 and fabricated or moulded from resiliently flexible polymeric materials.

In this particular construction of the non-return valve 50 an annular flange 62 is provided at the inlet end of the valve body 52. The valve body 52 fits about a filler tube 64 of a fuel tank and the flange 62 provides a seal against a panel 66 of a motor vehicle (not shown). In use, a filler nozzle 68 is retractably received within the valve 10 so as to deflect the diaphragm 54 to permit a flow of gasolene into the fuel tank via the nozzle 68. Thus, the diaphragm 54 is resiliently deformed so as to expose a collapsible opening 70 through which the nozzle 68 passes. Importantly, the diaphragm 54 forms about the nozzle 68 to prevent the escape of gasoline vapours from the filler tube 64 or tank. When the nozzle is retracted from the valve 50 the valve membrane 54 returns to its collapsed condition wherein it obstructs or closes the collapsible opening 70. Thus, in the collapsed condition fuel vapour is prevented from escaping the tank or flowing in a reversed direction toward the inlet 58.

Figures 7 to 9 schematically illustrate a moulding tool which is appropriate for forming a non-return valve such as 10 described above. The tool shown generally as 80 is designed for use in a conventional injection moulding machine.

The tool 80 includes two (2) mutually engagable die sections 82 and 84. Each of the die sections 82 and 84 includes a shaft and a collar 86/88 and 90/92, respectively. The shaft 86 and collar 88 of one of the die sections 82 is machined together whereas the collar 92 is allowed to rotate on the shaft 90 of the other die section 84. This allows for removal of the tool 80 from the

external thread 38 of the non-return valve 10 of this example. The part cut-away view of Figure 7 shows in some detail the internal geometry of the tool 80 which defines an internal cavity 94 for injection of the polymeric material. Importantly, a relatively thin projection 96 is connected to the shaft 86 and extends across the apex of the resultant valve 10. This projection 96 thus forms or defines the collapsible opening or aperture 22 of the valve 10.

Figure 8 illustrates the tool 80 of Figure 7 in a retracted position with the die section 82 removed from the injected valve 10. The collar 92 of the other die section 84 is then rotated so as to release the injected valve 10 from the tool 80. As the injected polymer cools the membrane or diaphragm 14 is released from the shaft 90 of the other die section 84. However, the shaft 90 of the other die section 84 may also include a plunger or other means to assist or aid in removal of the injected valve 10. Figure 8 also depicts injection and relief ports 98 and 100, respectively, which provide a flow of polymer to the die cavity 90. One of the die sections 82 or 84 may also include a dowel pin 102 for interengagement of the die sections 82 and 84. The injector ports 98 provide a discriminate point for polymer to be injected uniformly throughout the cavity 90 of the tool 80. The relief ports 100 allow an even flow and distribution of injected polymer throughout the die cavity 90.

Now that preferred embodiments of the present invention have been described in some detail it will be apparent to those skilled in the art that the non-return valve has at least the following advantages:

(i) the non-return valve is relatively simple in construction;

(ii) the non-return valve is effective in operation relying on fluid pressure for opening, and valve membrane characteristics and design for closure; and

(iii) the non-return valve is relatively inexpensive to manufacture.

Those skilled in the art will appreciate that the invention described herein is susceptible to variations and modifications other than those specifically described. For example, injection moulding is merely one exemplary technique of forming the non-return valves. The non-return valve may include a membrane of a different configuration to the conical-shaped diaphragm described provided it prevents reverse flow in its collapsed condition and opens with pressure on its inlet side.

All such variations and modifications are to be considered within the scope of the present invention the nature of which is to be determined from the foregoing description.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A non-return valve comprising:

a valve body including a fluid passageway which defines a fluid inlet and a fluid outlet, the fluid passageway being adapted to allow a flow of fluid from the inlet to the outlet; and

a valve membrane connected across the fluid passageway, the valve membrane including a collapsible opening and being constructed of a resiliently flexible material whereby the valve membrane in a collapsed condition obstructs or closes the collapsible opening to prevent fluid flowing in a reverse direction toward the inlet whereas pressure imposed on an inlet side of membrane deflects the membrane to expose the opening and allow fluid to flow through the passageway from the inlet to the outlet only.

2. A non-return valve comprising:

a valve body including a passageway which defines an inlet and an outlet, the passageway at least partly being adapted to retractably receive a fluid nozzle; and

a valve membrane connected across the passageway, the valve membrane including a collapsible opening through which the fluid nozzle is retractably received and being constructed of a resiliently flexible material whereby the valve membrane in a collapsed condition obstructs or closes the collapsible opening to prevent fluid flowing in a reverse direction toward the inlet whereas insertion of the nozzle through the opening deflects the membrane to permit a flow of fluid through the passageway and across the membrane from the inlet to the outlet only via the fluid nozzle.

ABSTRACT

A non-return valve comprises:

a valve body including a fluid passageway which defines a fluid inlet and a fluid outlet, the fluid passageway being adapted to allow a flow of fluid from the inlet to the outlet; and

a valve membrane connected across the fluid passageway, the valve membrane including a collapsible opening and being constructed of a resiliently flexible material whereby the valve membrane in a collapsed condition obstructs or closes the collapsible opening to prevent fluid flowing in a reverse direction toward the inlet whereas pressure imposed on an inlet side of membrane deflects the membrane to expose the opening and allow fluid to flow through the passageway from the inlet to the outlet only.

3. A non-return valve as defined in claim 1 or 2 wherein the valve membrane is formed integral with the valve body.

4. A non-return valve as defined in claim 3 wherein the valve membrane is in the form of a generally conical-shaped diaphragm having the collapsible aperture located at or adjacent its apex which is orientated in a downstream flow direction.

5. A non-return valve as defined in any one of the preceding claims wherein the valve membrane is constructed of a mouldable polymeric material.

6. A non-return valve as defined in any one of the preceding claims wherein the valve body is configured to retrofit to an existing valve stem.

7. A non-return valve as defined in any one of claims 1 to 5 wherein the valve body is designed to be sealably inserted into a flow line.

DATED this 15th day of JUNE 1999
ALIGNED INITIAL CONCEPTS PTY LTD

By their Patent Attorneys
GRIFFITH HACK

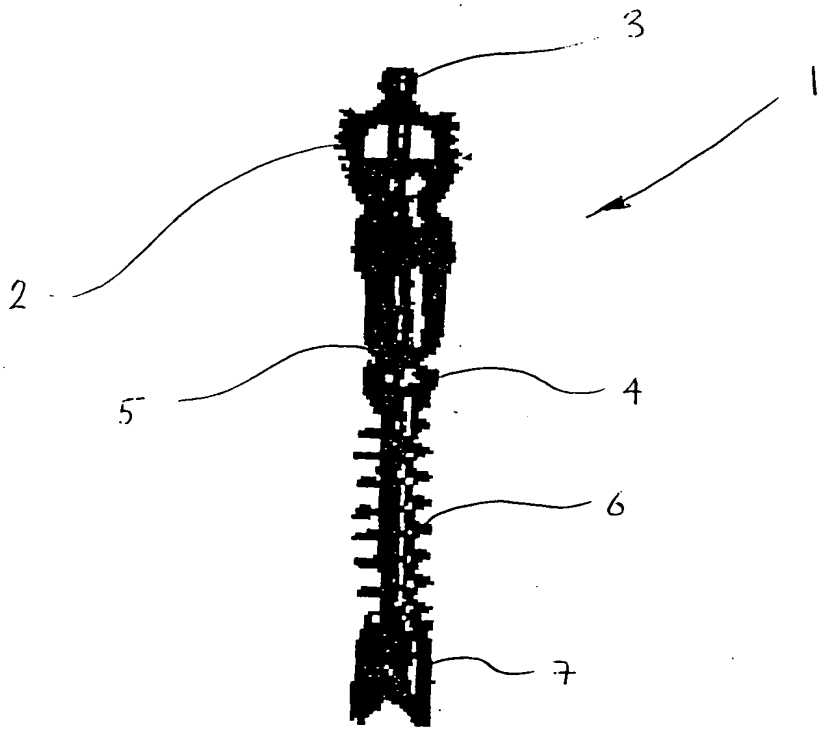


FIG. 1

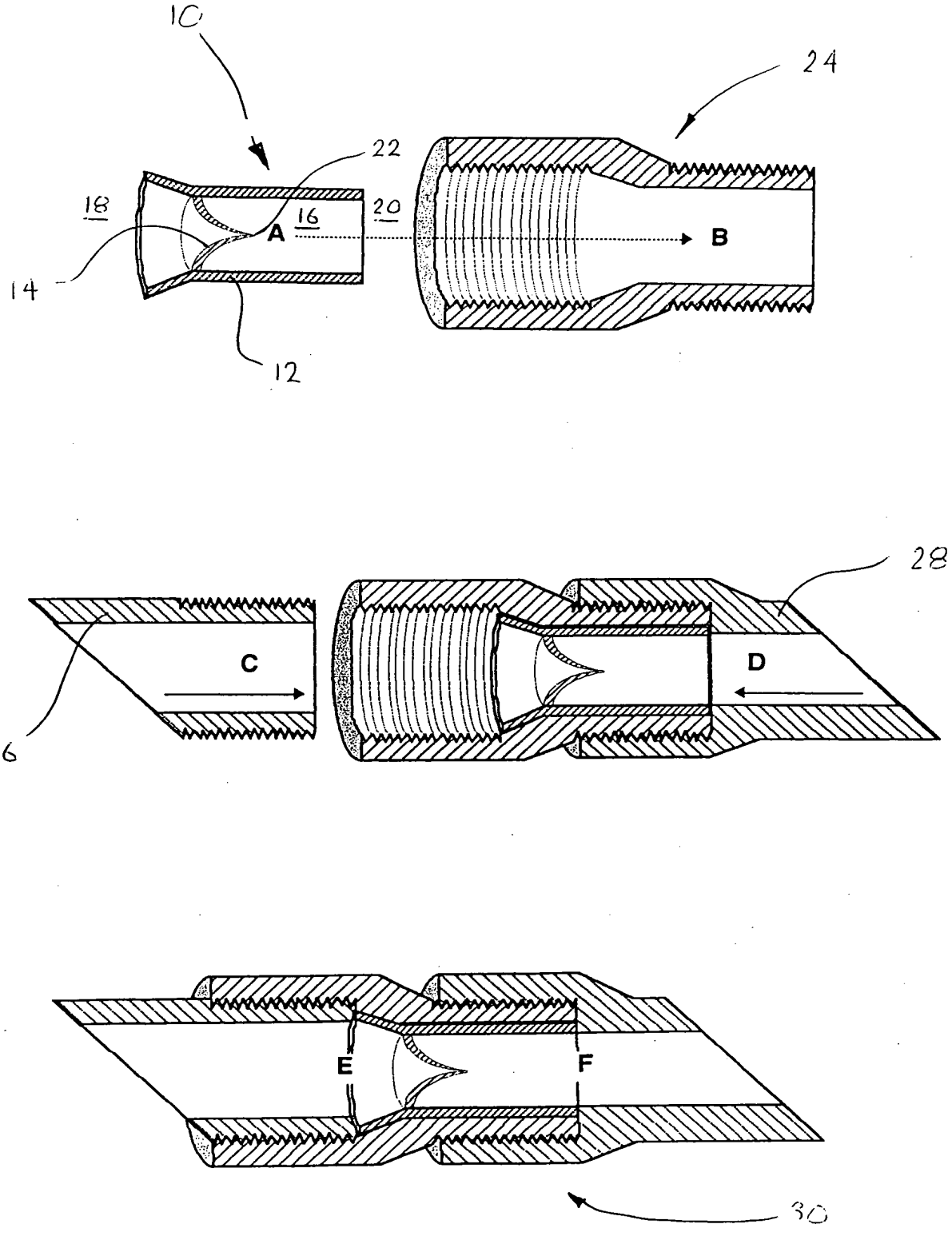


FIG. 2

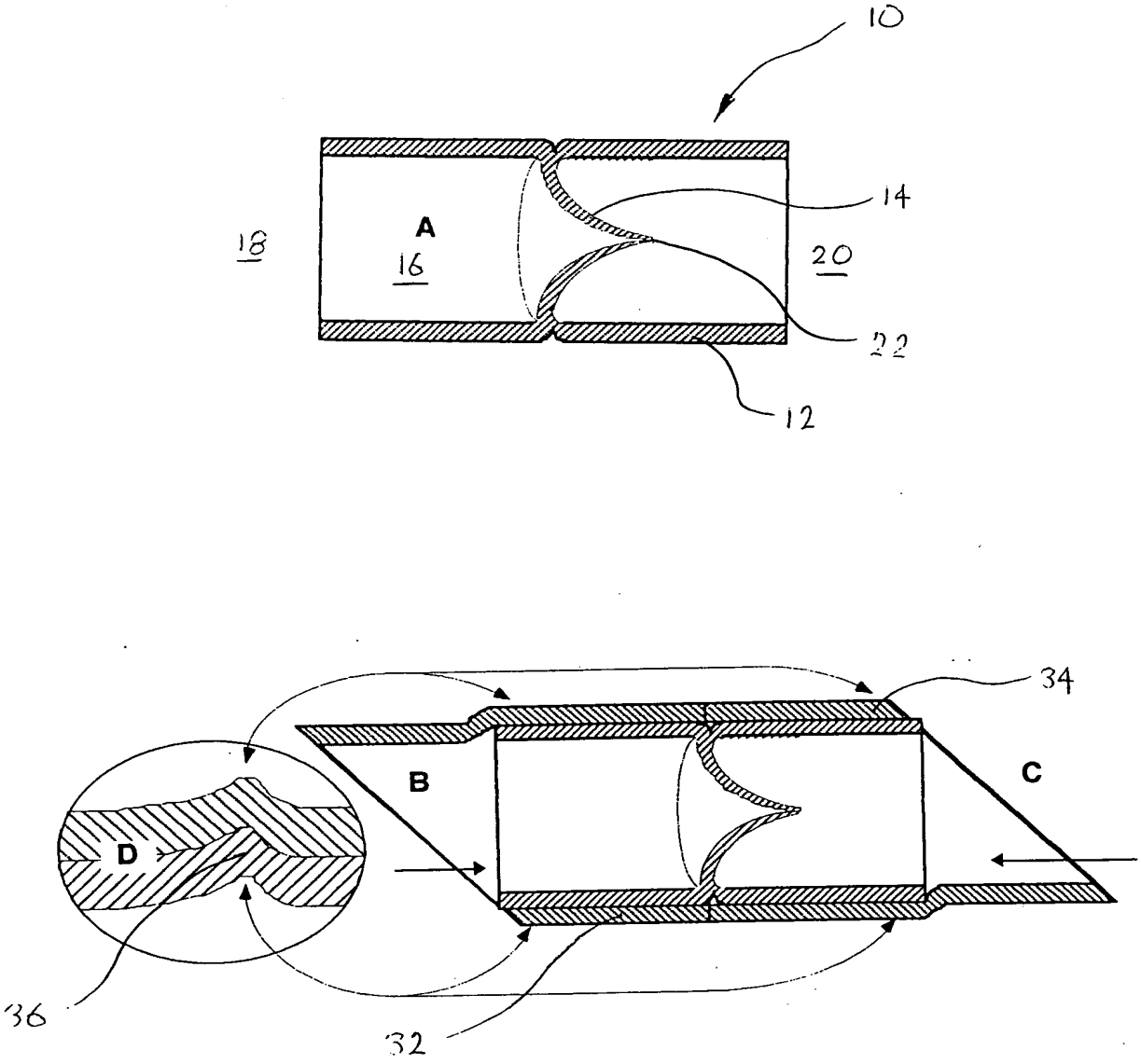
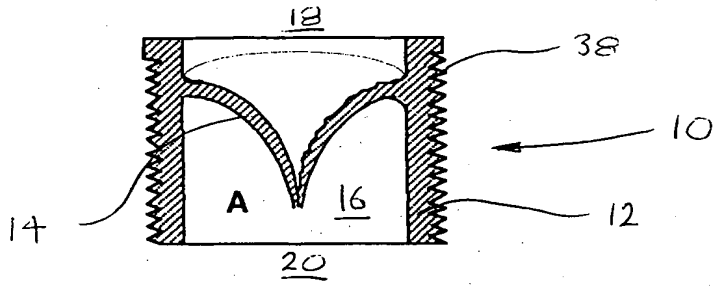


FIG. 3



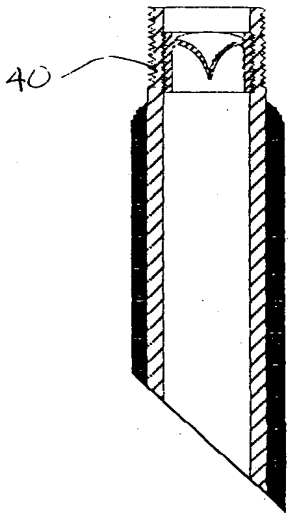


FIG. 4

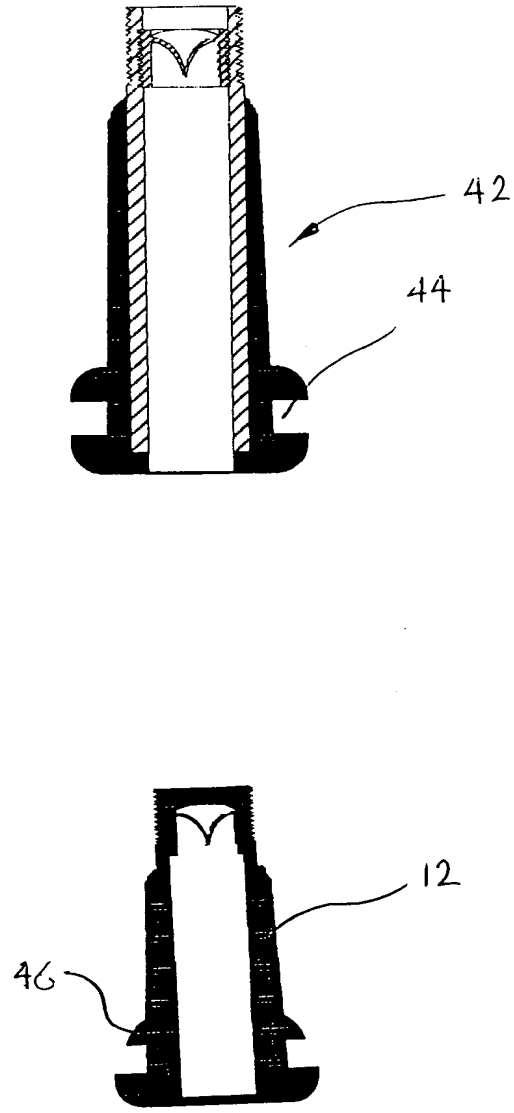
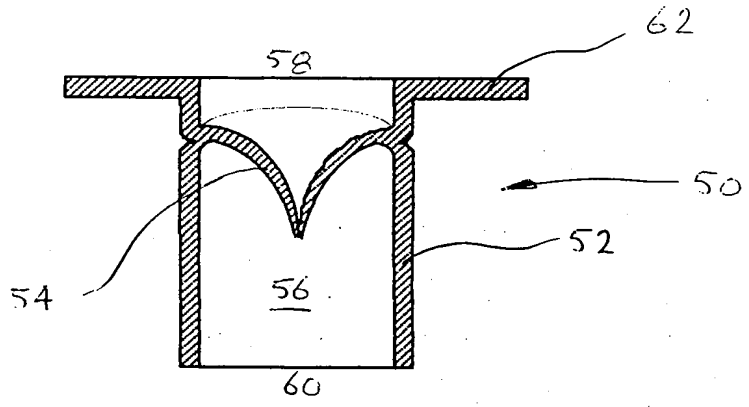


FIG. 5



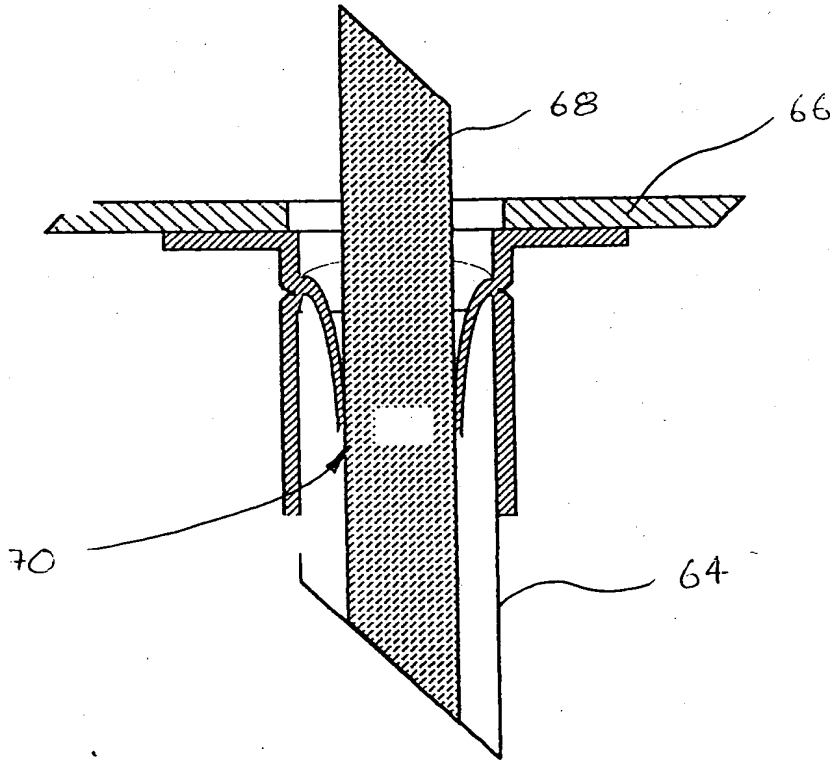
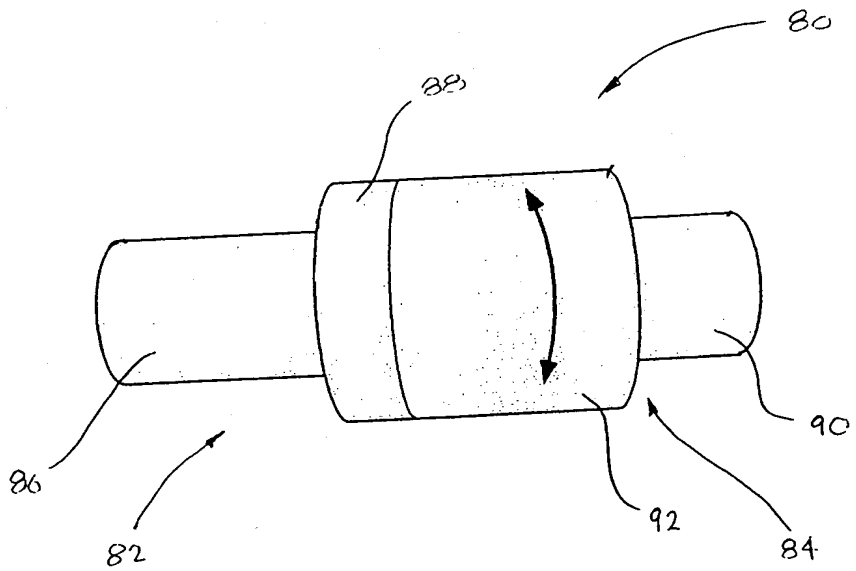
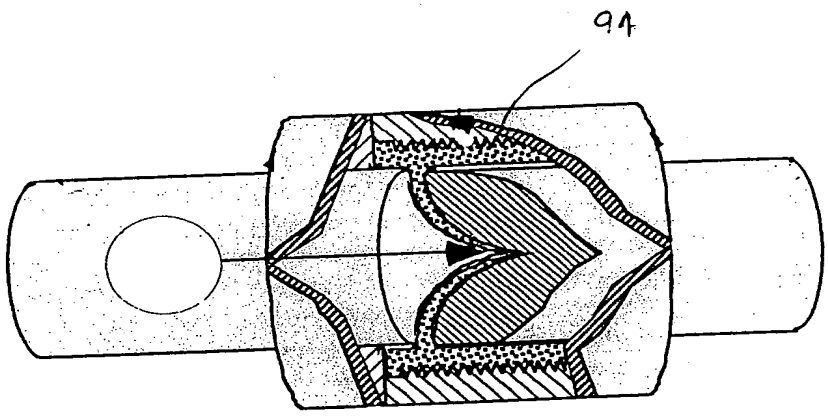


FIG. 6





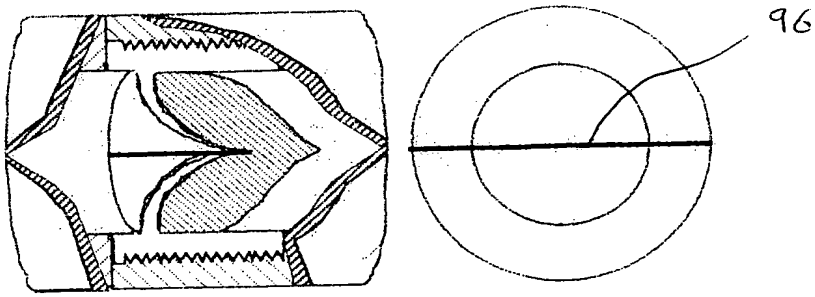


FIG. 7

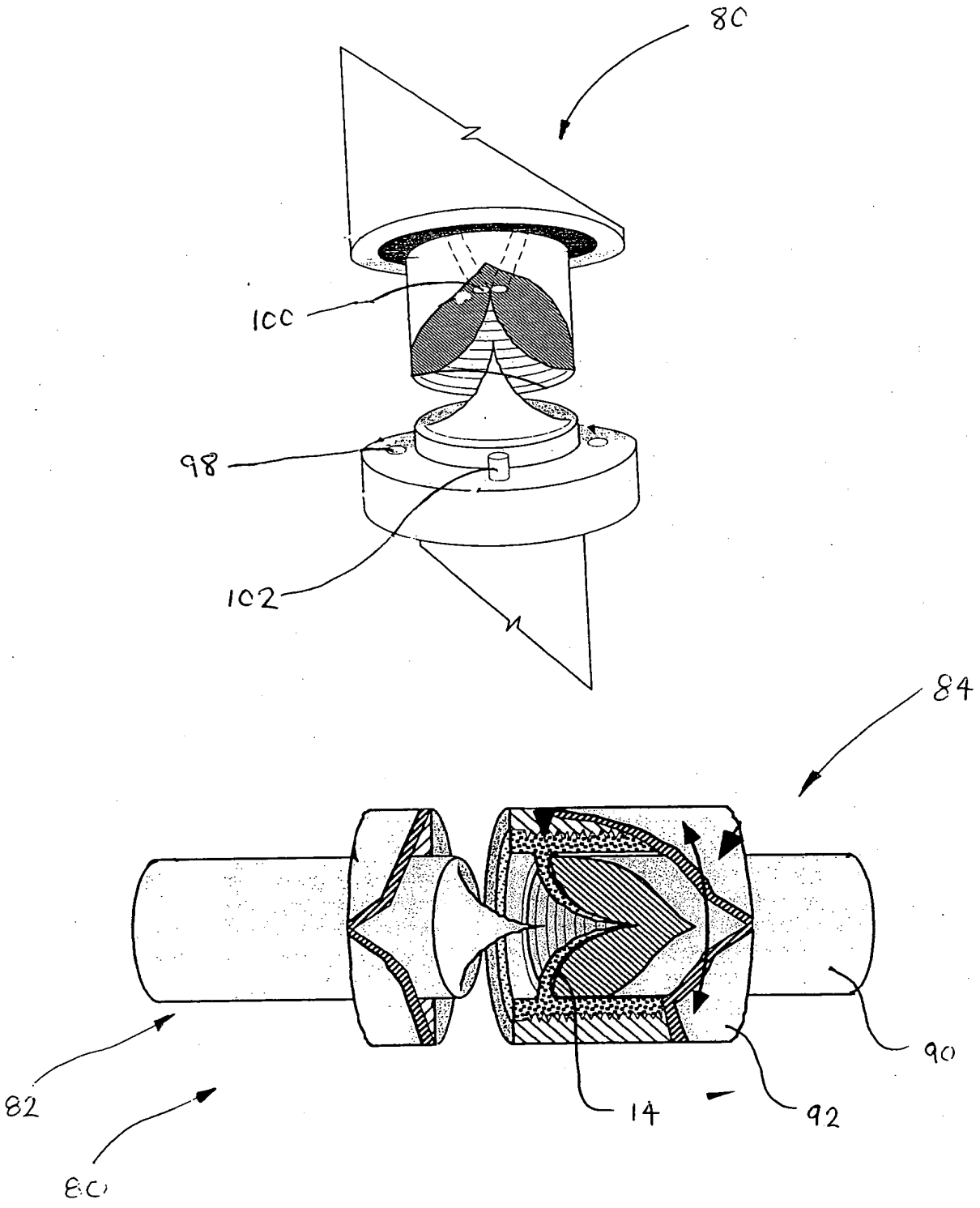


FIG. 8

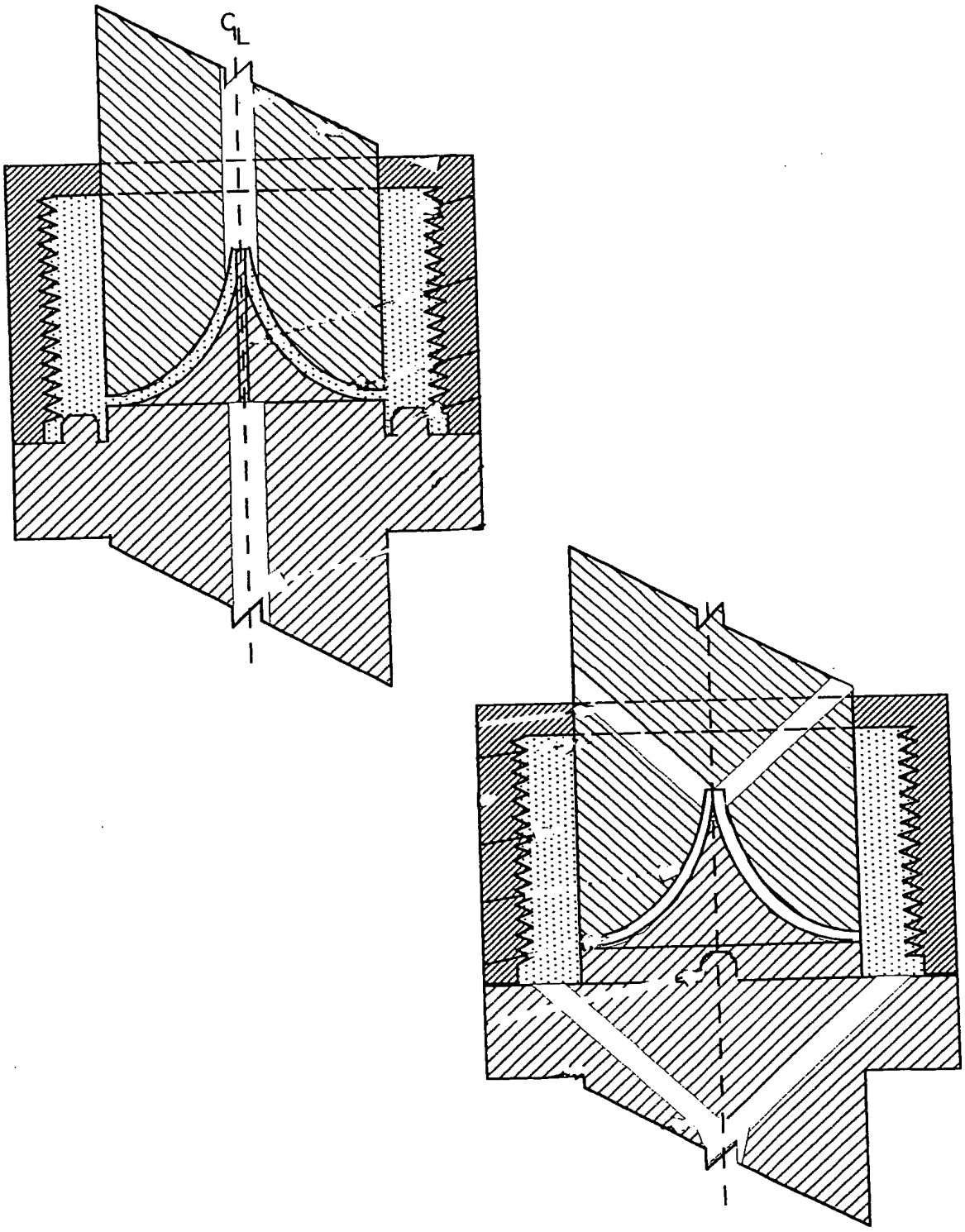


FIG. 9